

REMARKS

Reconsideration of the above-identified application, as amended, is respectfully requested.

In the Office Action of December 28, 2007, the Examiner first objected to the drawings under 37 C.F.R. 1.83(a) as not showing a particular recitation in Claim 4 directed to “a second substrate having a flat surface profile and an alignment layer formed thereon” and said “LC molecules aligning parallel to the alignment direction of said second substrate”

As a preliminary matter, applicants have canceled Claim 4 and rendered Claim 7 in independent form to include all of the limitations of canceled Claim 4. Thus, the independent Claim 7 further recites that the LC molecules aligned parallel to the grooves enables decreased potential energy of said LC molecules. Moreover, in view of canceling Claim 4, Claims 3, 5-6, 8-9 and 18 are being amended to set forth proper dependency upon amended independent Claim 7. Claim 2 is being canceled herein without prejudice.

Moreover, Claim 7 is being amended to correct an inaccurate recitation in canceled Claim 4 that the LC molecules align “parallel to the alignment direction of said second substrate”. However, as canceled claim 4 sets forth a second substrate having a flat substrate profile, an alignment layer has alignment direction either parallel with or to form a angle with respect to the alignment direction of the first substrate. Notwithstanding, Claim 7 has been amended to correct this discrepancy by now setting forth that LC molecules align parallel to the alignment direction of said alignment film layer formed on said grooved surface of said first substrate. (The antiparallel direction is one of the special case. The alignment direction of the second substrate could be different from the first one.)

This is further clarified in the NEW (drawing) SHEET attached hereto and particularly to a new proposed FIG. 4 to be added depicting a LCD display device portion 99' comprising an alternate embodiment wherein the second (top) over-layer substrate 100' has a "flat" surface profile and flat alignment film layer 120' formed thereon as the claim sets forth, and a new FIG. 5, depicting cross-sectional view of the device of FIG. 4 showing the second over-layer substrate 100' having the "flat" surface profile. Respectfully, no new matter is being entered as full support may be found in the original specification (e.g., paragraph ¶[0021] describing how only one substrate surface may have the grooved surface profile and, in original Claim 4 setting forth the flat surface profile of the top alignment layer [of the] second substrate.

The new Figs. 4 and 5 thus provides antecedent support for the recitations indicated in now amended Claim 7: a second substrate having a flat surface profile and an alignment layer formed thereon. The Examiner is respectfully requested to remove this objection under 37 C.F.R. 1.83(a).

With respect to the recitation "LC molecules aligning parallel to the alignment direction of said second substrate" while claimed (in originally filed Claim 1 and, for example, paragraph ¶[0029] described in the specification, the Examiner objected to the drawings as not showing this feature. Applicants, in response, submit a NEW (drawing) SHEET, attached hereto, and particularly, a new proposed FIG. 6 corresponding to FIG. 1 as originally filed, to be added depicting an LC molecule (e.g., LCD molecule 301) aligning parallel to the alignment direction of the first substrate in response to ion beam bombardment (as independent Claim 7 has been amended to clarify the LC molecules aligning parallel to the alignment direction of said alignment film layer of formed on said grooved surface of said first substrate). This is in contrast to the molecule 302 shown in Fig. 6 as sitting on a ridge of

a groove. Respectfully, no new matter is being input as full support is found in the original claims 1, Claim 12, step d (now canceled), paragraph ¶[0012] described in the specification and the aforementioned specification paragraph ¶[0029].

The new Fig. 6 thus provides antecedent support for the recitations indicated in now amended Claim 7: LC molecules aligning parallel to the alignment direction of said alignment film layer formed on said grooved surface of said first substrate. The Examiner is respectfully requested to remove this objection under 37 C.F.R. 1.83(a).

In light of the proposed new FIGS. 4-6 provided in the attached drawing sheets labeled NEW SHEETS, the specification is being amended to indicate reference to the new Figures in the Brief Description of the Drawings as new paragraphs following paragraph [0019]. Further, paragraphs ¶[0021] and ¶[0022] are being amended to include the descriptions of proposed new drawing Figures 4 and 6, respectively, and a new paragraph following ¶[0029] is proposed to be added describing new proposed Figure 5.

Further in the Office Action, the specification was objected to as failing to provide proper antecedent basis for the claims subject matter – particularly of Claims 4, 5 and 7. Applicants respectfully submit that the addition of new proposed Fig. 6 addresses the objection to Claim 4 (now canceled and added to amended Claim 7) and the limitation of Claim 7 as originally filed in that it illustrates alignment of an LCD molecule parallel to the alignment direction of the first substrate" and further illustrates how an aligned LC molecule 301 disposed parallel to the grooves is of decreased potential energy of the LCD molecules as compared to molecule 302 sitting on a grooved edge. With respect to the objection to the specification as not providing antecedent basis for supporting Claim 5, applicants are further amending paragraph ¶[0029] herein to clarify that the alignment layer 216 shown in Fig. 3

has a grooved surface profile as Claim 5 sets forth. Respectfully, no new matter is being entered as full support is found in originally filed Fig. 3, for instance.

In view of the foregoing, the applicants respectfully request that the objections to the specification be removed.

Further in the Office Action, Claims 2, 6, 8, 10-11 and 18 were objected to as being allegedly unclear as to which alignment layer the applicant is referring to since there are two (2) alignment layers recited in Claim 4.

In response, Claim 7 is being amended to respectively set forth a “first” alignment layer corresponding to the first (bottom) substrate having grooved surface profile, and to set forth a “second” alignment layer corresponding to the second top substrate having flat surface profile as now shown in new Figs. 4 and 5. Claim 2 is being canceled thus rendering the objection to Claims 2 and 8 moot.

Claim 6, it is respectfully submitted, is clear with explanation and specification support being added for new Fig. 6 being added to support the idea of how anchoring energy may be increased (i.e., potential energy of a LCD molecule aligned parallel to the alignment direction of the first substrate is decreased). For instance, as shown in Fig. 6 and the supporting specification descriptions proposed to be added, the LC molecule 301 which is sitting inside the groove has a lower potential energy than molecule 302 that is sitting on the ridge of the groove. That is, the grooved structure increases anchoring energy by reducing the potential energy of the molecules when they are situated along the groove.

With respect to the objection of Claim 10 and 11, it is respectfully submitted that the formation of discontinuous groove depends on the method of groove generation and would be known to skilled artisans. If rubbing is used to make grooves, the discrete nature of the fiber in the rubbing material will automatically produce random spaced discontinuous groove. If

the groove is made by Langmuir Boldgett film or dipping and pulling method, the grooves have random and discontinuous nature. One can generate mask with linear lines with random length or spacing to make groove lithographically.

In response, Claim 18 is also further being amended to set forth that the alignment film formed on said first substrate having said grooved surface profile is subjected to an incident ion beam in a direction parallel to a grooving direction... Respectfully, applicants submit this clarifies Claim 18 in that the “first” substrate already has a grooved surface profile such that the alignment film formed on said first substrate having said grooved surface profile is subjected to an incident ion beam in a direction parallel to a grooving direction. This is also very clear from Fig. 1 and new Fig. 6 proposed to be added.

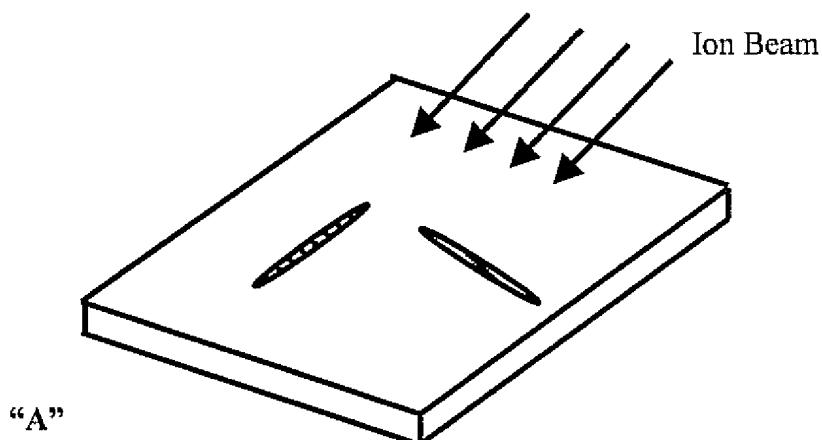
In view of the foregoing, applicants respectfully submit that the claims as amended herein, are now rendered more clear, and the Examiner is respectfully requested to remove the objections to Claims 2, 6, 8, 10-11 and 18.

Further in the Office Action, the Examiner rejected Claims 2-11 and 18 under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement. The Examiner particularly took issue with the last clause of Claim 4 (“aligning molecules parallel to the alignment direction of the second substrate”), and, the recitation of Claim 5 including a “second substrate aligned opposite the first substrate to include a top alignment layer having a grooved surface profile”.

Applicants respectfully disagree in view of the clarifying amendments made herein to Claim 7 to clarify the first (bottom) substrate having the grooved surface profile with the “first” alignment layer having the grooved surface profile, and second (top) substrate having a flat surface profile and a second alignment film layer formed thereon. This is now illustrated in new Figs. 4 and 5 proposed to be added. Further in response, Claim 5 is being amended to

actually recite the alternate embodiment shown in originally filed drawing Figs. 2 and 3, wherein the second substrate is aligned opposite said first substrate and has a grooved surface profile and the second alignment layer having a grooved surface profile.

With respect to the 35 U.S.C. §112, first paragraph rejection of Claim 7 applicants provide a simple illustration below labeled drawing "A" detailing, for the Examiner's edification, the origin of the 90-degree meta-stable state:



This drawing particularly illustrates for the Examiner how, on a "flat" alignment layer or substrate surface with IB beam alignment, molecule 301 and 302 have same potential energy; and that, as shown in proposed new Fig. 6, the LC molecule 301 which is sitting inside the groove has a lower potential energy than molecule 302 that is sitting on the ridge of the groove. The grooved structure increase anchoring energy by reducing the potential energy of the molecules when they are situated along the groove. The recitation in rejected Claim 7 is directed to this concept of reducing the potential energy of the molecules when they are situated along the groove with full support in the specification as filed and the new proposed drawing figures illustrating the embodiment of Claim 7 having a flat surface profile for the "second" (top) substrate.

In view of the foregoing, Applicants respectfully submit that the recitations relied upon in the rejection of Claims 5 and 7, as amended, are a result of the methodology described herein and illustrated, particularly in new proposed Fig. 6 and the additional drawing "A" provided for the Examiner's edification, and additionally, when gleaned from the paragraphs ¶[0022] and ¶[0023] of the originally filed specification.

For these reasons, the Examiner is respectfully requested to withdraw the rejection of Claim 7 under 35 U.S.C. §112, first paragraph.

In view of the foregoing remarks herein, it is respectfully submitted that this application is in condition for allowance. Accordingly, it is respectfully requested that this application be allowed and a Notice of Allowance be issued. If the Examiner believes that a telephone conference with the Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is requested to telephone the undersigned.

Respectfully submitted,



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